



Laboratories Pollution Prevention Fact Sheet

Utah Department of Environmental Quality *Promoting a Healthy Environment*

Laboratories can benefit by the use of both pollution prevention and waste minimization. Pollution prevention means not generating waste in the first place by reducing it at the source. Waste minimization is a broader term that also includes recycling and other means to reduce the amount of waste which must be treated or disposed of.

Most, if not all, laboratories produce waste of some kind. The waste can be either nonhazardous or hazardous. Generally, the most difficult wastes to manage are of a chemical nature. A waste chemical is a chemical that has no further use. A hazardous waste is a chemical that presents a danger to people or the environment. Regulatory agencies determine which chemicals are considered hazardous. Sometimes, specific chemicals are regulated as hazardous substances (e.g., carbon tetrachloride). Other times, chemicals or chemical mixtures are regulated based on their hazardous characteristics, such as ignitability, reactivity, corrosivity, and toxicity. Most hazardous waste definitions and requirements are set by the federal government; however, some states have differing definitions and requirements. Consequently, it is important to also check state regulations to see which waste chemicals are regulated as hazardous.

Chemicals

- Purchasing Chemicals. Effective pollution prevention and waste minimization in the laboratory begins with purchasing decisions. The idea is to buy only what you need, because, if you don't buy it, you don't have to dispose of it. The American Chemical Society estimates that unused chemicals can constitute up to 40% of the wastes generated by a lab. Often, these chemicals are useless (or even unstable) because their shelf life has expired. Problems in purchasing excess chemicals arise when estimates of use cover long periods of time, such that needed for a full year. The simplest way to increase the accuracy of estimated chemical use is to shorten the time horizon and buy only what you need for a single experiment. If you buy smaller quantities more often, your inventory should shrink. The problem, many believe, is that it is cheaper to buy chemicals in bulk. However, an important fact to consider is that the cost savings realized by buying in bulk are frequently offset by the costs of disposing of the unused chemicals.
- Managing Chemical Inventories. Managing chemical inventories can prevent many of the ills that plague environmental managers and laboratory staff. That is, unknown chemicals, excessive inventory stocks, and poor use of materials. By managing chemical inventories in a few simple but effective ways, you can avoid many of these problems.

' Labeling:

1. Require identification of all chemical and waste containers.
2. Adopt a standard labeling procedure for chemical and wastes.
3. Use labels that are colorfast and permanent.

‘ Store chemicals in a centralized place:

1. Store chemicals in a place that reduces risks of breakage and spills.
2. Store incompatible materials separately.
3. Store chemicals at the correct temperature.
4. Inspect stored chemicals for signs of leakage.
5. Spill and leak protection should be available in chemical storerooms.

‘ Track chemicals from “cradle to grave”:

1. The chemical tracking system should be designed to track chemicals from the time of purchase to the time of use and disposal.
2. A “cradle to grave” system includes a centralized inventory space, a file or data management system, and a person assigned as its manager.
3. Conduct regularly scheduled inventory audits.
4. Regularly dispose of chemicals that are not being used.

‘ Storing waste prior to disposal:

1. Storing wastes should follow many of the same practices as that of new chemical stocks.
2. Hazardous wastes should be labeled accordingly.
3. People handling the waste should be properly trained and familiar with the hazards and regulations associated with it.
4. Laboratories are limited in the amount of hazardous waste they can accumulate on a site. Under federal and state law, if you accumulate more than 1000 kgs, you will be subject to considerable regulation.

- Dealing With an Inventory of Unwanted Chemicals: Old inventories are a common problem. These inventories tend to sit around because it is too much trouble to dispose of them properly. However, these inventories are a huge liability. Dealing with an accidental exposure to a staff member or visitor will be a lot more trouble than safely disposing of the unwanted and potentially dangerous inventory.

1. If you know what a chemical is and can safely and legally dispose of it, then do so. Hazardous or unlabeled inventory is a job for professionals.
2. Contact a reputable hazardous waste disposal contractor to properly pack and dispose of these chemicals.
3. Contact local and state governments. They can point you toward the right type of disposal strategies.
4. Once you dispose of the inventory, avoid inventory from accumulating in the future.

- Conducting Experiments: Pollution prevention and waste minimization don’t necessarily require major changes in the way you run experiments. Some basic efforts to be more

efficient and careful with the experimental procedures can substantially reduce the amount of waste generated.

1. Use solvents and other hazardous chemicals sparingly.
 2. Monitor experimental reactions closely and add additional chemicals only as necessary.
 3. Conserve water and electricity when possible.
- Substituting Materials: Substitution of hazardous chemicals in the laboratory with nonhazardous (or at least less-hazardous) chemicals may be possible. If you use nonhazardous chemicals in place of hazardous chemicals, you avoid hazardous waste problems. Substitution in the lab should be considered before such options as reuse or recycling.
 - Reusing and Recycling Chemical Resources: After doing as much as possible to prevent and minimize waste generation through source reduction, the next most preferable options are recycling and reuse. Although laboratories tend to avoid recovery efforts because of the costs in time and money involved, chemicals can often be recovered at net costs lower than the cost of disposal.
 1. Solvent recovery can be very cost-effective, as well as environmentally sound. Spent solvents that are properly segregated can be easily distilled in-house to a high purity that will often allow multiple reuse of the same solvent.
 2. Metal recovery is as readily accomplished by a variety of processes.

Segregating Waste Streams

Segregating laboratory wastes during handling, and storing is important for safety reasons, for legal reasons, for pollution prevention reasons, and for ensuring the lowest disposal costs.

- Incompatible Materials: Segregation of incompatible materials in a storage area is critical.
 1. Ignitables should be separated from oxidizers or sources of ignition, especially solvents.
 2. Acids should be separated from bases, and oxidizing agents from reducing agents.
 3. Other more specific chemical incompatibilities can be found in waste management publications.
 4. Different groups of solvents should be kept separate (e.g., halogenated vs. non-halogenated solvents).
- Hazardous and Nonhazardous Waste: Segregation of hazardous and nonhazardous waste should always be maintained to prevent mixed wastes being classified as hazardous waste. Likewise, organic and inorganic waste streams should be segregated. Mixed waste

disposal is considerably more expensive than non-hazardous waste.

- **Recyclable Wastes:** Waste streams that you can recycle, especially recoverable metals and solvents, should be stored separately. In some cases, segregation will be important to facilitate recycling

Organizations

Listed are some organizations that may be of help establishing a pollution prevention program in the laboratory.

1. National Science Foundation
2. United States Environmental Protection Agency
3. American Chemical Society

For More Information, Contact:

Department of Environmental Quality (801) 538-536-4400

Division of Solid & Hazardous Waste (801) 538-6170

Environmental Hotline (800) 458-0145

Pollution Prevention Coordinator (801) 536-4477